TPRS

Quarterly Report

The official journal of the leading regional amateur radio digital communications organization of the Americas

FEBRUARY 2000

Published by the Texas Packet Radio Society · Volume 14, Issue 3

President's Report

President's Report
Tom McDermott, N5EG

TexNet

One sad note to report is that we have lost our wire-line connection between NDALLAS and AUSTIN. This was installed, and had been perfectly operational for about 12 years. The carrier was Qwest, who had graciously donated all the services needed to provide this. As Qwest is migrating over to it's fiber infrastructure, they eliminated the microwave radio site at the NDALLAS building, and vacated the office there. Additionally, we have had increasing difficulty in accessing the NDALLAS building, so the two events have pretty much crippled our connectivity between the north and south parts of the network. As some guessed 3-4 years ago, dedicated VF circuits would become increasingly difficult to obtain as they become more and more obsolete in today's Internet world. Thus TPRS started along a path to use the Internet for connectivity in place of the wire-lines. Unfortunately, we do not yet have a good IP infrastructure in place today, and thus we have a rather complete loss of connectivity. Further, our existng TexNet nodes are pretty old, and lacking in computational horsepower. It was hoped that we would have the TAPR FHSS radio available by now, but this project has turned out to be larger and much more complex

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TPRS Quarterly Report

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than anticipated. Thus, we face several years of delay in restoring our network connectivity.

Hamcom 2000

The Hamcom 2000 planning committee has been busy this year, and it promises to be a great convention, the theme this year is "The Future is Back". The exhibits will be open Friday, June 9, from 12 noon, to 7:00 PM, and Saturday, June 10 from 7:00 AM to 5:00 PM. Note the extended booth hours on Saturday. The hotel next to the convention center has changed management, this year it's called the Wyndham Arlington DFW Airport South (that's a mouthful), and can be reached at 800-442-7275, they have a special rate (no Ranger's game this year).

TPRS and TAPR have joined forces in the booth again this year, and we'll have booths 98 and 99 in the commercial exhibit area. Seems demand for the booths has been pretty strong so far. The program will be announced as soon as we have it finalized, many of the speakers have committed, we're still trying to close on a few (before March 14th which is the deadline).

TAPR FHSS SS Radio update

A fair amount has happened on the TAPR SS radio project. New RF and Digital boards have been laid out, and one copy of the second engineering model of the RF board has been assembled and is in test with the RF guys. A debugging harness for the RF board has been generated - it allows using a serial interface to emulate the SPI interface, and thus a BASIC program running on a PC allows us to program all the functions of the board, via it's PIC chip. This will allow us to test a lot of the functionality of the RF board, and the functionality of the PIC code in a straight-forward manner. The new digital boards are not yet built, so some time will elapse until we're ready to start on that. Some significant changes are: 1) the Ethernet interface chip was changed, since Motorola issued an end-of-production notice on the one we were using, and 2) the Xilinx FPGA (which

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was discussed in previous QR's) has be inserted into the layout.

Linux and Wireless LANs

Starting with this issue of the QR, we will run a long-term sequence of articles written by Jean Tourrilhes, of HP Labs, from his series of articles and papers on the web. This is a great series, and discusses a lot of topics related to Linux device drivers, LAN devices, LAN technology, and Linux extensions for Wireless. Reprinted by permission of the author.

On a personal note, I have changed employers in the last quarter of 99, and now work for a start-up company. Thus, the QR has slipped a little bit in schedule, and it's becoming increasingly difficult t to maintain that schedule. As the start-up activity picks up, my personal time will become even more compressed. I hope that a long-running series will help us to keep the QR on a reasonable schedule. Comments welcome. -30-

Wireless LAN resources for Linux

Jean Tourrilhes

Foreword

I got involved in the Wireless LAN world by hacking the Wavelan drivers for Linux. I'm quite curious, so I start gathering information to know how the damn beasty was working.

Then, I realised that there was no central point where you could find all this information, links to the drivers and issues with Linux. So, I start stuffing it on my web pages, and it slowly evolved to what you see now.

I'm no longer active on the Wavelan drivers, but I'm also still following the work of Wireless LAN (called as well WLAN or Radio Ethernet), especially in relation with Linux. So, once every century, I update my **Linux Wireless LAN Howto** and the collection of links. I hope that it is useful to someone...

Introduction

*Linux & Wireless LANs : Un*x, with no string attached...*

This document will explore the magical world of **Wireless LANs** and **Linux**. Wireless LAN is not a very widespread and well known technology, even in the Linux world, so we will try to gather here most of the available information. Despite the fact that it is very similar to common networking technologies, it is significantly different to justify this specific document covering the subject.

1 What is a Wireless LAN ?

It's a **networking** technology allowing the connection of computers without any wires and cables (apart from the mains), mostly using **radio** technology (and sometime **infrared**). It's called LAN (Local Area Network) because the range targeted is small (within an office, a building, a store, a small campus, a house...). This technology is slowly growing (I should say maturing), and despite a general lack of interest, Linux is able to take advantage of some of the wireless networks available.

2 Content of this document

My first task is to talk a bit about the different Wireless LANs options under Linux. What the **products** on the market are, their compatibility with Linux and where to find the necessary bits and pieces to make them work. This should help you to make your mind on the product of your dreams.

Once you've picked a Wireless LAN, you will have to live with it. The next chapter go through the main **differences** of Wireless LAN compared to other networking technologies. This includes the main steps of the installation and usage considerations.

Then, we will have a nice overview of the Wireless Extensions. The **Wireless Extensions** is a new standard interface to configure Wireless LAN devices and get wireless specific statistics from them. Of course, this is a Linux exclusivity !

At this point, you will find a long and dense section,

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talking mostly of the different **technologies** used in Wireless LANs and other boring related stuff. It is quite safe to skip that one.

3 Target and Assumptions

The main goal of this document is to reduce the traffic of unanswered questions related to wireless in the Linux newsgroups and mailing lists (and in my mailbox). After that, you should have no more arguments for asking foolish questions around.

I hope that this document will help people to make the most of their Wireless LAN under a competent operating system and understand what is in the box. If I could convince people to give it a try, it would make me happy.

This document act mostly as a complement to the exhaustive documentation existing for Linux. Because of that, I might not explain every details of everything and target already quite knowledgeable people. Don't worry, there is a section on how to improve your culture at the beginning of the section 3.

4 Legal stuff

Strange world where everybody has to protect himself from sharks, lawyers and crazy people :

Any information in this document is purely fictious and any resemblance to real hardware, software or driver is purely coincidental... I mean, if because you read this document your hardware burn, you get fired from your job or anything else bad happen, I'm not responsible, it can't be my fault, so please use your own brain. Writing this kind of documents is not part of my job at HP, so I don't expect them to claim any responsibility for its content.

Any brand mentioned in this document is trademark of its respective owner. For example Linux is a trademark of Linus Torvalds.

Then, this is my document, written by me (Jean Tourrilhes), therefore I own its copyright. So don't remove my name (and copyright notice) and pre-

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Texas Packet Radio Society, Inc.

TPRS was founded in 1985 and is an educational, public service, and scientific research non-profit corporation. Texas Packet Radio Society goals are:

1- design and research amateur radio packet networks
2- provide education in the area of general packet usage

To accomplish better communications in the region, TPRS has been organizing statewide working groups to cover various networking topics. The current working groups are the Mailbox/BBS Group, TCP/IP Group, and the TexNet Support Group. TPRS hopes that these working groups will help promote information exchange in their respected areas in Texas. New working groups are formed as needed to provide channels for discussion and to help provide direction for that area of digital communications. Anyone can participate in a working group; TPRS membership is not required.

TexNet

TPRS has established a digital packet network protocol, a standard hardware package for the network nodes, and software modules that implement the TexNet network.

The basic design philosophy of TexNet is an open, inexpensive, multi-resource, high speed 'backbone' with access through multi-connect capable local nodes. On the high speed side, TexNet is a 9600 baud network system. For local access, compatibility with the typical 2 meter AX.25, 1200 baud, AFSK/FM station is the operational norm. Other baud rates and modulation techniques can be supported on the primary user port or secondary port. The system is totally compatible with both versions of the AX.25 protocol specifications for user connections. With these general specifications, TexNet has been designed and tested to enable all users to take advantage of this high speed, full protocol protected packet network system.

Each node offers, in addition to TexNet access, local area digipeater service, 2 conference bridges for full protocol protected roundtable or net operation, a full mult-connect, multi-user mailbox system, a local console for installation and maintenance setups, a debugger module for long distance and local software monitoring,and an interface for a weather information server for regional weather information, if available.

The NCP-PC (TexNet for PC) creates a direct interface to the PC platform. The Z80 based PC card supports 4 channels for communications. This co-processor approach allows the AX.25 and TexNet-IP to run on the card without affecting the PC. This allows the full power of the PC to be used for network applications. The versatility of this board is only now being developed and applications are endless.

The TexNet Network

The Texas TexNet network system has been operational since October 1986. When fully operational, the network reaches from the border of Mexico to Missouri. Use of the Texas TexNet system is open to all amateur operators. TPRS has been coordinating the installation of the Texas TexNet system. Further expansion of the system depends entirely upon the amateur community.

INFORMATION

TPRS is interested in spreading our information and research efforts as widely as possible. We want other groups involved with packet efforts to get in contact with us. We will provide information for those amateur packet groups that are interested in this system for their areas. If you would like more information concerning TPRS or TexNet, please drop a letter to:

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TPRS MEMBERSHIP

TPRS membership is widespread with most members located in Texas, but members are located in other states and in foreign countries. Membership is open to any interested person. If you are interested in becoming a member and receiving the TPRS Quaterly, please send your name, address and call with membership dues of $12 per year. A membership application is available elsewhere in this issue.

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tend that you wrote it yourself. In matter of copy, distribution and modification, you should ask me politely and use common sense.

Having said that, this document is also licensed under the terms of the Linux Documentation Project Copying License.

5 This document

This document is only available in the format that are convenient to me (acrobat/pdf, html). It might be updated in the future (if I feel like it and if I have some time). I guess that it is pretty safe to assume that it will still be available for the time to come at these **web** addresses :

http://www.hpl.hp.com/personal/Jean_Tourrilhes/Linux/Wireless.html

http://www.hpl.hp.com/personal/Jean_Tourrilhes/Linux/Wavelan.html

I may be reached at the following **e-mail** address : jt@hplb.hpl.hp.com

Constructive comments and interesting information are welcomed. I hope that you will help me to keep this document up to date and improve its content.

Comments about my english and my style will be answered in french. Flames and spam will be processed through a Rayleig Fading channel with a -120 dB attenuation in order to reduce the noise :-)

The devices, the drivers

The who's who of Wireless LANs under Linux.

This section describes the most common Wireless LAN products available on the market and their **compatibility** with Linux. I will make a short description of each product and will mainly focus on the drivers.

Except in a few case, you need a **driver** to interface you wireless network device to the Linux kernel. The availability of a driver is as usual your main concern, especially with wireless devices because few people are using such hardware, so few of them are willing to develop, debug and maintain such a piece of code.

For each driver, I will list its *status* (stable, buggy...), the *maintainer*, the *version*, how to *get it* and the main *features*. If you hear about something new or if you have developed yourself a driver, please notify me.

1 Lucent Wavelan & DEC RoamAbout DS

Driver status : stable
Version : v19 (20/4/99) or v20 (29/7/99)
Where : isa : Linux kernel (2.0.37, 2.2.11 & 2.3.15)
pcmcia : Pcmcia package (3.0.11)
Maintainers : Jean Tourrilhes <jt@hpl.hp.com>
Web page : http://www.hpl.hp.com/personal/Jean_Tourrilhes/Linux/Wavelan.html
Documentation : man pages, headers
Configuration : Wireless Extensions
Statistics : Wireless Extensions
Multi-devices : isa : up to 4
pcmcia : yes
Other features : module, hardware multicast, Wireless Extensions
Non implemented : roaming
Bugs : see release notes on web page :-(
License : GPL & OpenSource
Vendor web pages : http://www.wavelan.com/
http://www.networks.digital.com/dr/wireless/
http://www.cabletron.com/dnpg/dr/npg/lanfm-mn.html

1.1 The device

The Wavelan has been around for quite a while now. The Wavelan is a radio LAN, using the 900 MHz or 2.4 GHz ISM band (Direct Sequence). It is built by Lucent, formerly AT&T, formerly NCR, and there is a few OEM version (for example the DEC RoamAbout DS). The Wavelan comes in two flavours, an ISA card and a PCMCIA card (plus the access point).

The Wavelan appears to the PC as a standard network card and interfaces naturally with the networking stack. The configuration includes setting the frequency (10 different channels), Network ID

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(16 bits). Hardware encryption is optional (DES or AES - 64 bits key).

This product is built around a standard Ethernet controller (that may be found in some 3Com and Intel Ethernet cards), and the Ethernet physical layer is replaced by a radio modem. The ISA and Pcmcia cards share the same basic architecture, have the same modem, but have different Ethernet Controllers and bus interfaces (the pcmcia has only one transmit buffer). Because the Wavelan doesn't use a specific radio MAC (no MAC level retransmissions for example), it uses very efficiently the bandwidth, but is more sensitive to packet loss and collisions.

There is two versions of the modem, a 900 MHz and a 2.4 GHz version. Revision 2 of the 2.4 GHz modem allows the user to set the frequency (from a set of predefined channels - the availability of each channel depend on the regulation). The Wavelan is Direct Sequence Spread Spectrum (11 chips encoding), using a 2 Mb/s signalling rate (using effectively 22 MHz of bandwidth) and diversity antennas.

1.2 The driver

The ISA driver has also been around for quite a while now in the kernel and is pretty stable. The last set of modifications were to solve a few remaining small problems and add Wireless Extensions and some other features, so the driver is fairly complete now. The only things remaining to do is the implementation of the roaming protocol (but it might come, if I'm not too lazy...).

The Pcmcia driver has caught up with the ISA one to offer the same level of functionality and reliability. The only difference are the pcmcia specific functions (auto loading, auto unloading, power saving).

The drivers use the card EEprom to save the configuration changes for subsequent reboots. Wireless Extensions let you configure the NWID, the frequency, the sensitivity and the encryption key (optional). Statistics include the signal quality, signal level, noise level and the count of packet received with an invalid NWID (see Wavelan documentation). Private Wireless Extensions include the setting of the quality threshold.

2 Lucent Wavelan IEEE, Apple Airport & Cabletron RoamAbout 802

Driver status : fairly stable
Version : v1.0.4
Where : Pcmcia package (3.1.9)
Maintainer : Andreas Neuhaus <andy@fasta.fh-dortmund.de>
Web page : http://www.fasta.fh-dortmund.de/users/andy/wvlan/
Documentation : readme, headers
Configuration : Wireless Extensions & module parameters
Statistics : Wireless Extensions
Multi-devices : yes, but the ISA to Pcmcia bridge must be reconfigured
Other features : MTU selection, multicast
Non implemented : SMP
Bugs : none reported...
License : GPL
Vendor web page : http://ww.wavelan.com/ http://www.apple.com/airport/ http://www.cabletron.com/wireless/

2.1 The device

Even if it uses the same name, the Wavelan IEEE product is completely different from the old Wavelan, and totally incompatible in term of protocol and hardware interface. It is still built by Lucent, and it still operate in the 2.4 GHz ISM band (Direct Sequence), but the new hardware fully support the IEEE 802.11 protocol and is no longer based on a Ethernet chip. There is only a Pcmcia version (the ISA version uses a ISA to Pcmcia bridge) and the different access points.

The recently announced Apple AirPort is in fact the Lucent Wavelan IEEE repackaged (the second generation, 802.11 HR compliant). The AirPort card for the iBook is the OEM version of the Wavelan, with the antennas being pre-integrated in the laptop. Note that the interface doesn't seem to be Pcmcia compatible even is the connector is the same, so this card can't be used in the normal PC-Card slot of other laptops. Cabletron is also

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selling the Wavelan IEEE as RoamAbout 802.11.

The Wavelan appears to the PC as a standard network card and interfaces naturally with the networking stack. The configuration includes only setting the network name (ESSID), the rest is automatic (finding the equivalent BSSID and channel). As usual for Lucent, the documentation and website are rich.

As with all IEEE 802.11 products, the Wavelan offer a fully featured MAC protocol, including MAC level acknowledgement (good news for all of us having dealt with the old Wavelan card), optional RTS/CTS, fragmentation, automatic rate selection, roaming. This seems exhaustive, but is mandatory for IEEE 802.11 compliance. Different version of the card include different level of security (bronze is basic, silver is with WEP (RC4-40 bits) and gold is with proprietary 128 bit encryption.

The 2.4 GHz modem is an enhanced version of the previous generation, Direct Sequence Spread Spectrum (11 chips encoding), using both 1 and 2 Mb/s signalling rate (using effectively 22 MHz of bandwidth), diversity antennas and with 13 different frequencies (depending on the regulations). The modem sensitivity seems especially good (so, I predict a good range).

Lucent also sells a "turbo" version of the card, which in addition to the standard IEEE 802.11 bit rate (1 and 2 Mb/s) adds 5 and 10 Mb/s bit-rates for shorter range using Lucent proprietary modulations (so, not compatible with 802.11 HR and other 11 Mb/s products).

Finally, Lucent offers as well the second generation of the Wavelan IEEE, which is much cheaper and fully compliant with the new 802.11 HR standard, supporting 5.5 and 11 Mb/s bit-rate (compatible with other 11 Mb/s products). This is the version used in the Apple Airport.

2.2 The driver

Andreas Neuhaus is busy working to improve this driver. The driver is based on Lucent source code, which is a cut down version of their full driver. So, it lacks all the part about handling natively 802.11 frames and Lucent proprietary API, and initially it lacked some of the more fancy features of Lucent's driver, but *Andreas* is adding them slowly. Of course, the driver support all version of the card (bronze, silver, gold - basic, turbo, turbo 11 Mb/s) and is fully interoperable with Access Points and Windows nodes.

Andreas has done a very good job into providing features like Wireless Extensions (I must admit that I did help him quite a bit ;-) and many configuration parameters (station name, channel, mtu size). The new version adds Power management and encryption setting, change of the operating mode via Wireless Extensions, promiscuous and multicast support...

The driver is still not SMP compliant, and more work is needed in this area.

Note that Lucent has also released a binary library driver (see below) which is more complete than the driver of *Andreas* (except for Wireless Extensions). (Note: other devices omitted here - see web site.)

Wireless LANs in use

"Why can't I receive the FM on my Wireless LAN ?"

Installing and using a Wireless LAN is not such a big deal, and is not much different from other kind of networks. In this chapter, I will give you a few tricks on how to install those beast and will mostly redirect you to a lot of literature explaining the things much better than I would do.

Then, I will explain some of the difference of Wireless LANs compared to wired technology from the user point of view and why it reacts sometime differently. For more curious people, see the section 5.

1 Choice and selection of a Wireless LAN

There is far too many people buying a Wireless LAN and discovering only after that it is not sup-

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ported under Linux. So, please, check that a driver is **available** for the hardware you plan to use.

Most Wireless LANs are designed to work well in most configurations, but my experience tells that some Wireless LANs or some environment may be capricious. Of course, the vendor won't advertise this, so it's your responsibility to check that the Wireless LAN is working with your particular setup. If you intend to cover a large range, **test** as many physical locations and combinations as possible to avoid surprises. Know the limits of your hardware.

The performance of different Wireless LANs may vary widely, depending on may factors. The throughput of two Wireless LANs advertising the same bit rate may vary by a factor 5 (I won't give the names). So, be warned and **benchmark** your Wireless LAN...

If you are not happy with your choice of Wireless LAN, don't hesitate and **return** it to where you bought it for a refund.

2 Installation

The reader should be familiar with some of the documents listed in the *Useful readings chapter* below, because the information here mainly acts as a complement to them. A good knowledge of your Wireless LAN is also a prerequisite before switching to Linux.

Most Wireless LAN vendors have tried to make things easy and offer product with an interface as similar as possible as **Ethernet**, and which work mostly the same way. So, a bit of background on Ethernet and the general Linux networking is welcomed (see below).

The operating system need a piece of software to interface to the hardware. That is the role of the **driver**. Basically, when Linux gives to the driver a packet to send, the driver have to copy the packet to the hardware and toggle the correct bits in the correct register on the card to send it. It is the same when the card generates an interrupt, the driver go and read the packet and give it to Linux. Of course, the driver needs to know about the specific hardware details and the specific operating system ways.

In conclusion, you must check first if the driver for your Wireless LAN exists (see previous section), because in many case it proves to be quite useful...

With Linux, you have to **compile** the driver source code (some Linux distribution may offer precompiled modules). There is usually two compilation options : drivers compiled staticaly in the **kernel** and as a **module**. If the driver is already in the kernel sources, the compilation is quite simple (you have to enable it in the kernel configuration, static or module). If it is in the **Pcmcia package**, you just need to install the package. Otherwise, see the installation instructions coming with the driver.

Once you've got the driver compiled, you must tell your system about it. For pcmcia drivers, the package has its own **configuration scripts** (see pcmcia documentation). For other drivers, you will have to edit the system configuration scripts. You will likely to have to add a *ifconfig* line in some script (/etc/init.d/network for the *Debian*). There is many other networks configuration files in /etc. For modules, you need as well to change some stuff in the module configuration files. See the list of readings below for more information.

3 Useful Linux related readings

Ethernet HowTo - How to install and configure most of the network drivers

Net2 HowTo - The network stack story

Module HowTo- To compile you driver as a module

Pcmcia HowTo - An excellent medicine for pcmcia drivers

AX25 HowTo - AX25 and Radio Amateur users should enjoy this one

(Continued next issue.)

TPRS Node Assigments
Official Publication: February, 2000
Subject to Corrections/Additions/Deletions.

X = ACTIVE/COMPLETED
T = ACTIVE/TEST
P = PENDING

Nr	Status	City/Town	Alias	Call	User Port	Remarks
3	X	Dallas	TEXNET	WR5C	145.05	PMS
2	T	Richardson	TESTBED	W9DDD	None	R&D
	T	Richardson	RICH	W9DDD	None	R&D
1	X	Murphy	MURPHY	N5EG	145.09	
5	P	Austin	NWS	Unkn	None	Weather PMS
6	P	New Braunfels	STXWX	N5IUT	145.05	Weather PMS
7	X	Boerne	BOERNE	N5VUO	145.01	
8	X	Geronimo	GERONMO	WB5NSN	145.07	PMS(AKA GERLNK)
9	X	Austin	AUSTIN	WA5LHS	145.07	
11	X	San Antonio	ALAMO	N0CCW	145.09/223.50	
12	X	San Antonio	SALAMO	WA2MCT	None	
13	X	Denton	DENTON	W5NGU	145.03	
14	P	Lubbock	LUBBOCK	KC5KQF	145.05	
15	P	Midland	MIDLAND	WB5RXA	145.05	
16	X	Greenville	GREENVL	K5GVL	145.07	
17	P	Midland	MAFDXC	WF5E	223.58	DXCluster port
19	X	Rockport	ROCPRT	N5JKH	144.99/446.1	
20	X	C. Christi	CORPUS	N5XCH	145.05	
21	X	Pettus	PETTUS	KA5BWL	147.56	
23	P	Lubbock	LBBDXC	KA5EJX		DXCLUSTER
24	X	Austin	AUSDXC	K5TR	144.99	
25	X	Austin	ARESTC	W5TQ	145.73	
26	X	Victoria	VCTRIA	W5DSC	145.01	
27	X	Alice	ALICE	K5DYY	145.07	
28	P	Amarillo	AMARILO	WD5ILA	145.05	
29	P	Abilene	ABILENE	WB5EKW	145.05	
34	X	San Antonio	SANTEX	WB5FNZ	223.58	
42	X	Kingsville	TAMUK	W5ZD	144.91	(aka KINGVL)
43	P	Bryan/CollStn	SBRAZOS	KF5LN	145.05/446.10	
44	P	Bryan/CollStn	NBRAZOS	KG5ZD	446.1	(See Nr 43)
45	P	Fannin County	FANNIN	WB5RDD	145.05	
46	X	Sherman	SHERMAN	WB5CVR	144.91	
47	P	South Dallas	SDALLAS	KF5RN	None	
48	X	Waco	WACO	WD5KAL	145.09	
49	X	Falfurrias	FALFUR	WB5FRO	None	
50	X	Mercedes	VALLEY	W5RGV	144.60	DXCluster port 2
51	X	San Isidro	ISIDRO	K5RAV	None	
52	X	Brownsville	BROWX	K5RAV		NWS node
73	X	Fort Worth	FTWORTH	N5AUX	144.99	
80	T	AOHTST	AUSTIN	WB5AOH	None	R&D AUSTIN
95	T	TNC95	AUSTIN	WB5AOH	None	R&D AUSTIN

TPRS Node Assigments
Official Publication: February, 2000
Subject to Corrections/Additions/Deletions.
(Continued)

(100-150) Reserved for TexLink Node Usage

Nr	Status	City/Town	Alias	Call	User Port	Remarks
105	X	Floresville	FLORES	WD5DOE	None	
109	X	Refugio	REFUGIO	WB5OLT	None	
118		Moody	MOODY	W5ZDN	440.1	

(151-249) Reserved for Non-Texas Node Usage
(150-159) Reserved for Louisiana

151	X	Lafayette LA	LFTDXC	N5SYF	145.01	
152	P	BatonRouge LA	BTRDXC	N5VWM		
153	X	Maxie LA	MAXIE	K5USL	145.01	
160	X	Ft Gibson OK	FTGIBSN	N5GIT	145.01	
161	X	Muskogee OK	MKOTST	WA5VMS	446.5 PMS	
162	X	Muskogee OK	MUSKOGE	W5EJK	145.09	
164	X	Lincoln AR	FAYETVL	K5VR	145.69	
165	X	Clayton OK	CLAYTON	W5CUQ	145.03	
166	X	Ft Smith AR	FTSMITH	W5ANR	144.91	
168	X	Tulsa OK	NWTULSA	W5IAS	145.03	Temp. Off Air
169	X	Tulsa OK	TULWX	N5WX	NWS WX Server	
172	X	Okemah OK	OKEMAH	WB5HLR	145.69	
173	X	Choctaw OK	CHOCTAW	K5CAR	145.69	
174	?	Prarie Grove AR	HOGEYE	K5FXB	None	
175	X	Garfield AR	GARFLD	WB2ROC	None	
176	X	Aurora Missouri	OARSMO	K0SQS	145.05	
177	X	Mt Magazine AR	MAGAZIN	KF5XB	144.95	
178	X	Russelville	RSLVL	WB5BHS	UNKN	
179	X	Little Rock AR	LROCK	WB5SQK	144.97	PORT 2 446.50(FUTURE)
209	T	Little Rock AR	LRTST	KA5SQK	TEST Node	

(250-255) Network Reserved

If you are a TexNet node opearator/owner and have a correction to make to the list, advise to N0CCW@K3WGF.#STX.TX.USA.NOAM, or leave a message for N0CCW on the NDALLAS PMS of TexNet.

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Wireless LAN Resources for Linux

Be sure to visit the TPRS web page:
http://www.tprs.org
for the latest information on TPRS activities.

A current listing of Packet nodes, frequencies, and networks is located in the **North American Digital Systems Directory (NADSD) on-line at:**
http://www.tapr.org/directory/index.html

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